

In the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. – 24. (Canceled).

25. (Currently amended) A heat spreader ball grid array package, comprising:

a ball grid substrate;

a semiconductor chip affixed to the ball grid substrate;

a mounting compound encasing the semiconductor chip over the ball grid substrate;

a heat spreader mounted over the ball grid substrate and spaced apart from the molding compound to form a gap; and

thermal grease within the gap at least between the heat spreader and the molding compound, wherein the thermal grease comprises silicon rubber containing heat-conducting particles.

26. (Original) The structure of claim 25, wherein the semiconductor chip is a silicon chip, a germanium semiconductor chip or a silicon germanium semiconductor chip.

27. (Original) The structure of claim 25, wherein the molding compound is comprised of epoxy resin and a curing agent; and the heat spreader is comprised of copper, aluminum, chromium plated on copper, chromium plated on aluminum, nickel plated on copper or nickel plated on aluminum.

28. (Original) The structure of claim 25, wherein the molding compound is comprised of epoxy resin; and the heat spreader is comprised of copper.

29. (Currently Amended) The structure of claim 25, wherein the ~~thermal grease is comprised of~~ silicon rubber containing heat-conducting particles ~~such as~~ are selected from the group consisting of zinc oxide, aluminum oxide, aluminum nitride, boron nitride or ceramic fillers ~~or other material~~ which have the properties of heat conduction.

30. (Original) The structure of claim 25, wherein the thermal grease is comprised of epoxy resin, curing agent, a catalyst, a coupling agent, a filler, a flame retardant, a mold-release agent, a coloring agent and a stress-relief agent.

31. (Original) The structure of claim 25, wherein the thermal grease is comprised of epoxy resin, curing agent, a catalyst and a coupling agent.

32. (Currently Amended) The structure of claim 25, wherein the molding compound has coefficient of thermal expansion of from about $5 \times 10^{-6}/K$ to $15 \times 10^{-6}/K$; and the heat spreader has a coefficient of thermal expansion of from about $10 \times 10^{-6}/K$ to $25 \times 10^{-6}/K$.

33. (Currently Amended) The structure of claim 25, wherein the molding compound has coefficient of thermal expansion of about $7.0 \times 10^{-6}/K$; and the heat spreader has a coefficient of thermal expansion of $17.0 \times 10^{-6}/K$.

34. (Currently Amended) The structure of claim 25, wherein the semiconductor chip is a silicon chip and has a coefficient of thermal expansion of from about $2.5 \times 10^{-6}/K$ to $3.5 \times 10^{-6}/K$.

35. (Original) The structure of claim 25, wherein the heat spreader has a shape of an inverted square pie tin having an elongated surrounding lip.

36. (Original) The structure of claim 25, wherein the heat spreader has a shape of an inverted square pie tin having an elongated surrounding lip; the heat spreader being amounted onto the ball grid substrate at the elongated surrounding lip using epoxy adhesive.

37. (Original) The structure of claim 25, wherein the heat spreader has a shape of an inverted square pie tin having an elongated surrounding lip; and wherein the thermal grease nearly fills the gap.

38. – 40. (Canceled).

41. (Currently Amended) A heat spreader ball grid array package, comprising:

- a ball grid substrate;
- a semiconductor chip affixed to the ball grid substrate;
- a molding compound encasing the semiconductor chip over the ball grid substrate;
- thermal grease over the molding compound, wherein the thermal grease comprises silicon rubber containing heat-conducting particles;

a heat spreader mounted over the ball grid substrate, the molding compound and the thermal grease; and

a PCB substrate or a stiffener mounted to the heat spreader.

42. (Original) The structure of claim 41, wherein the semiconductor chip is a silicon chip, a germanium semiconductor chip or a silicon germanium semiconductor chip.

43. (Original) The structure of claim 41, wherein the molding compound is comprised of epoxy resin and a curing agent; and the heat spreader is comprised of copper, aluminum, chromium plated on copper, chromium plated on aluminum, nickel plated on copper or nickel plated on aluminum.

44. (Original) The structure of claim 41, wherein the molding compound is comprised of epoxy resin; and the heat spreader is comprised of copper.

45. (Currently Amended) The structure of claim 41, wherein the ~~thermal grease is comprised of~~ silicon rubber containing heat-conducting particles ~~such as~~ are selected from the group consisting of zinc oxide, aluminum oxide, aluminum nitride, boron nitride or ceramic fillers ~~or other material~~ which have the properties of heat conduction.

46. (Original) The structure of claim 41, wherein the thermal grease is comprised of epoxy resin, curing agent, a catalyst, a coupling agent, a filler, a flame retardant, a mold-release agent, a coloring agent and a stress-relief agent.

47. (Original) The structure of claim 41, wherein the thermal grease is comprised of epoxy resin, curing agent, a catalyst and a coupling agent.

48. (Currently Amended) The structure of claim 41, wherein the molding compound has coefficient of thermal expansion of from about $5 \times 10^{-6}/K$ to $15 \times 10^{-6}/K$; and the heat spreader has a coefficient of thermal expansion of from about $10 \times 10^{-6}/K$ to $25 \times 10^{-6}/K$.

49. (Currently Amended) The structure of claim 41, wherein the molding compound has coefficient of thermal expansion of about $7\text{-}9 \times 10^{-6}/K$; and the heat spreader has a coefficient of thermal expansion of $17\text{-}20 \times 10^{-6}/K$.

50. (Currently Amended) The structure of claim 41, wherein the semiconductor chip is a silicon chip and has a coefficient of thermal expansion of from about $2.5 \times 10^{-6}/K$ to $3.5 \times 10^{-6}/K$.

51. (Original) The structure of claim 41, wherein the heat spreader has a shape of an inverted square pie tin having an elongated surrounding lip.

52. (Original) The structure of claim 41, wherein the heat spreader has a shape of an inverted square pie tin having an elongated surrounding lip; the heat spreader being amounted onto the ball grid substrate at the elongated surrounding lip using epoxy adhesive.

53. (Original) The structure of claim 41, wherein the heat spreader has a shape of an inverted square pie tin having an elongated surrounding lip; and wherein the thermal grease nearly fills the gap.

54. – 56. (Canceled).

57. (New) The structure of claim 25, further comprising a pillar formed onto the ball grid substrate outboard of the semiconductor chip and the molding compound; wherein the heat spreader is mounted to the pillar.

58. (New) The structure of claim 25, further comprising a pillar formed onto the ball grid substrate outboard of the semiconductor chip and the molding compound; the pillar including a stiffer portion; wherein the heat spreader is mounted to the pillar.

59. (New) The structure of claim 25, further comprising a pillar formed onto the ball grid substrate outboard of the semiconductor chip and the molding compound; the pillar including a copper stiffener portion; wherein the heat spreader is mounted to the pillar.

60. (New) The structure of claim 41, further comprising a pillar formed onto the ball grid substrate outboard of the semiconductor chip and the molding compound; wherein the heat spreader is mounted to the pillar.

61. (New) The structure of claim 41, further comprising a pillar formed onto the ball grid substrate outboard of the semiconductor chip and the molding compound; the pillar including a stiffener portion; wherein the heat spreader is mounted to the pillar.

62. (New) The structure of claim 41, further comprising a pillar formed onto the ball grid substrate outboard of the semiconductor chip and the molding compound; the pillar including a copper stiffener portion; wherein the heat spreader is mounted to the pillar.